Claims

[c1] 1. A device for converting elapsed time into a voltage, comprising means for referencing an event edge either to a first clock signal, if said event edge occurs during a first portion of a clock cycle of said first clock signal, or to a second clock signal different than said first clock signal, if said event edge occurs during a second portion of a clock cycle of said first clock signal, wherein said first and second portions of the clock cycles of said first clock signal are alternating interludes.

[c2] 2. The device as recited in claim 1, wherein said referencing means comprise a multiplexer having first and second inputs for receiving said first and second clock signals respectively, and a third input for receiving clock selecting control signals, the occurrence of said clock selecting control signals determining the temporal boundaries between said alternating interludes.

[c3] 3. The device as recited in claim 1, wherein said first and second clock signals are offset from each other in phase only.

[c4] 4. The device as recited in claim 1, wherein said referencing means comprise digital logic for issuing clock selecting control signals, the occurrence of said clock selecting control signals determining the temporal boundaries between said alternating interludes.

[c5] 5. The device as recited in claim 2, wherein said referencing means further comprise digital logic for outputting said clock selecting control signals to said third input of said multiplexer.

[c6] 6. An imaging system comprising:
an event detector for generating said event edge upon occurrence of an event of interest; and
a system for converting elapsed time into a voltage as recited in claim 1.

[c7] 7. The imaging system as recited in claim 6, wherein said event detector comprises a detector that detects impinging radiation.

[c8] 8. The imaging system as recited in claim 7, wherein said radiation is a gamma

ray.

[c9] 9. The device as recited in claim 1, further comprising:
an event time-to-voltage converter comprising a first input for receiving said event edge and a second input for receiving a referenced one of said first and second clock signals from said referencing means; and
an analog-to-digital converter comprising a first input for receiving an output of said event time-to-voltage converter.

[c10] 10. The device as recited in claim 9, further comprising:
a reference time-to-voltage converter comprising an input for receiving said first clock signal; and
a sample and hold circuit comprising an input for receiving an output of said reference time-to-voltage converter,
wherein said analog-to-digital converter further comprises a second input for receiving an output of said sample and hold circuit.

[c11] 11. The device as recited in claim 10, further comprising a multiplexer for passing said first clock signal either to said referencing means or to said reference time-to-voltage converter.

[c12] 12. The device as recited in claim 10, further comprising digital logic for deriving said second clock signal from said first clock signal.

[c13] 13. A method of time stamping an event, comprising the following steps:
generating an event edge when an event of interest occurs;
generating a voltage proportional to the time elapsed from reception of said event edge;
referencing said event edge either to a first clock signal, if said event edge occurs during a first portion of a clock cycle of said first clock signal, or to a second clock signal different than said first clock signal, if said event edge occurs during a second portion of a clock cycle of said first clock signal,
wherein said first and second portions of the clock cycles of said first clock signal are alternating interludes;
maintaining the generated voltage at a constant value when a rising edge of

said referenced one of said first and second clock signals occurs; and digitizing said constant voltage value to form a time stamp.

[c14] 14. The method as recited in claim 13, wherein said first and second clock signals are offset from each other in phase only.

[c15] 15. The method as recited in claim 13, wherein said first and second clock signals are derived from a single source clock that operates at a higher frequency.

[c16] 16. The method as recited in claim 13, wherein said event is detection of radiation at a time and a place.

[c17] 17. The method as recited in claim 16, wherein said radiation is a gamma ray.

[c18] 18. The method as recited in claim 13, further comprising the step of calibrating said constant voltage value prior to said digitizing step.

[c19] 19. A system for time stamping an event, comprising:
means for generating a voltage proportional to the time elapsed from reception of an event edge;
means for referencing said event edge either to a first clock signal, if said event edge occurs during a first portion of a clock cycle of said first clock signal, or to a second clock signal different than said first clock signal, if said event edge occurs during a second portion of a clock cycle of said first clock signal, wherein said first and second portions of the clock cycles of said first clock signal are alternating interludes;
means for maintaining the generated voltage at a constant value when a rising edge of said referenced one of said first and second clock signals occurs; and
an analog-to-digital converter for digitizing said constant voltage value to form a time stamp.

[c20] 20. A system for time stamping an event, comprising:
a circuit for generating a voltage proportional to the time elapsed from reception of an event edge, said circuit comprising a current source, an integrating capacitor and an amplifier connected so that said amplifier outputs

voltage proportional to the time elapsed so long as current is being supplied by said current source;

digital logic for outputting clock selecting control signals;

a first multiplexer having first and second inputs for receiving first and second clock signals respectively, said first and second clock signals being different, and a third input for receiving said clock selecting control signals, said clock selecting control signals being timed so that said first multiplexer outputs said first clock signal if said event edge occurs during a first portion of a clock cycle of said first clock signal and outputs said second clock signal if said event edge occurs during a second portion of a clock cycle of said first clock signal, wherein said first and second portions of the clock cycles of said first clock signal are alternating interludes;

a switch for cutting off current to said amplifier from said current source when said first multiplexer outputs a rising edge of one of said first and second clock signals; and

an analog-to-digital converter for digitizing the voltage output by said amplifier.

[c21] 21. The system as recited in claim 20, wherein said first and second clock signals are offset from each other in phase only.

[c22] 22. The system as recited in claim 20, wherein said first and second clock signals are derived from a single source clock that operates at a higher frequency.

[c23] 23. The system as recited in claim 20, further comprising:

a reference time-to-voltage converter comprising an input for receiving said first clock signal; and

a sample and hold circuit comprising an input for receiving an output of said reference time-to-voltage converter,

wherein said analog-to-digital converter also receives an output of said sample and hold circuit.

[c24] 24. The system as recited in claim 23, further comprising a second multiplexer for passing said first clock signal either to said first multiplexer or to said

reference time-to-voltage converter.

[c25] 25. An imaging system comprising:
an event detector for generating said event edge upon occurrence of an event of interest; and
a system for time stamping as recited in claim 20.

[c26] 26. The imaging system as recited in claim 25, wherein said event detector comprises a detector that detects impinging radiation.

[c27] 27. The imaging system as recited in claim 26, wherein said radiation is a gamma ray.

[c28] 28. A time-to-voltage converter comprising:
a circuit for generating a voltage proportional to the time elapsed from reception of an event edge, said circuit comprising a current source, an integrating capacitor and an amplifier connected so that said amplifier outputs voltage proportional to the time elapsed so long as current is being supplied by said current source;
a multiplexer for alternatingly outputting first and second clock signals that are different; and
a switch for cutting off current to said amplifier from said current source when said multiplexer outputs a rising edge of one of said first and second clock signals.

[c29] 29. The time-to-voltage converter as recited in claim 28, wherein said first and second clock signals are offset from each other in phase only.

[c30] 30. The time-to-voltage converter as recited in claim 28, wherein said first and second clock signals are derived from a single source clock that operates at a higher frequency.